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Moss Species Discovered in Absheron National Park

Elshada Chalabi Nuraddin
Doctoral student, Azerbaijan Institute of Food Safety

ABSTRACT: Detailed information is given on the distribution, ecology, botanical properties and uses of mosses studied in the Absheron National Park, in Azerbaijan and in the world. The types identified as a result of the study are shown and information about their relevance is given. The main objective of the study was to evaluate modern scientific knowledge about the biomorphological properties of 9 species of moss, its use in traditional and folk medicine, its properties, presence and their impact on various diseases. As a result of the study, *Grimmia* Hedw of the family *Grimmiaceae* Arnott. 6 species belonging to the genus (*Grimmia unicolor* Hook, *Grimmia pulvinata* (Hedw.) Sm., *Grimmia reflexidens* Müll., *Grimmia muehlenbeckii* Schimp., *Grimmia trichophylla* Grev., *Grimmia anomala* Hampe.), *Orthotrichum* Hedw. of *Orthotrichaceae* Arnotta family. belonging to the genus, (*Orthotrichum spesiosum* Nees in Sturum, *Orthotrichum strangulatum* P. Beauv), *Fontinalaceae* Schimp. of the family *Fontinalis* Hedw. of the genus *Fontinalis antipyritica* Hedw. types have been discovered. As a result of scientific research, 9 species of moss were discovered. Of them: *Grimmia muehlenbeckii* Schimp. as a species is new to the bryoflora of Azerbaijan.

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Corresponding Author: Elshada Chalabi Nuraddin

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INTRODUCTION

On Earth, mosses are one of the divisions of higher plants that have undergone a unique evolutionary path. According to the latest literary data, up to 800 genera and 25 thousand species of mosses are known, which are included in 3 classes. These plants are sensitive to environmental factors, but are not very demanding. They can live on rocks, in caves and on tree trunks, anthropogenic substrates where other plants cannot live, from deserts to high mountain peaks, from the equator to the poles of the globe. Thus, they actively participate in the creation of most ecosystems, maintaining the gene pool, enrichment, soil formation, the circulation of substances and as environmental indicators. Absheron National Park is located in the Khazar region and covers an area of 783 hectares. Being a state reserve, this territory is located on the territory of the executive power of the city of Baku. The Shah-Dili region in the southeast of the Absheron Peninsula is located on 375 hectares of land and 408 hectares of sea. Absheron National Park was established by the Decree of the President of the Republic of Azerbaijan dated February 8, 2005 on the basis of the Absheron State Nature Reserve in the administrative territory of Baku. The national park is located in the south-eastern part of the Absheron Peninsula in the Shah Dili region. The main purpose of the establishment of the Absheron National Park was environmental protection, its effective use, protection of rare species of flora and fauna that are under threat of extinction, development of ecotourism, creation of tourist zones, nature conservation measures, monitoring and environmental education of the population [1]. The main purpose of the research conducted in this area was to study the spore plants (bryoflora) common in this area. The main purpose of the research conducted in this area was to study the spore plants (bryoflora) common in this area. As a result of scientific research, 9 species of moss were discovered. Of them: Grimmia muehlenbeckii Schimp. - Grimmia Muhlenbergii as a species is new to the bryoflora of Azerbaijan.

MATERİALS AND METHODS

Research objects are mosses found on different substrates. Different methods were used during the research. Thus, the detected mosses were collected, the taxonomic composition was noted, and their morph ecological characteristics were. It was studied by the Ignatev method.To study the effect of phytochemicals contained in the common hop plant in traditional and folk medicine, the relevant literature and methods were used [8].

RESULTS AND DISCUSSION

Detailed information on the species identified in the study area is provided. Many samples were collected and analyzed in the laboratory, and the results were recorded:

Family: *Grimmiaceae* Arnott
Genus: *Grimmia* Hedw.
Species: *Grimmia unicolor* Hook

Botanical description: This species is covered with dense spots from pale green to red-brown. Stem 1.5-4(-5) cm, leaves narrowly oblong-lanceolate, leaves 1.5-2.5×0.5-0.7 mm, both edges curved inward, slimy, cup-shaped, fragile. Medial lamellar cells are rounded to square, smooth, thick-walled, distal lamellar cells 2-3-layered, rounded and thick-walled. Capsule protruding, brown, oblong-ovoid, exothecial cells short-rectangular, thin-walled, rectangular, 2-3 rows of thick-walled cells, annular and long-billed [4, 6].

Ecology: Usually found on wet acidic siliceous rocks, especially along lake shores (Fig. 1.).

Fig 1.*Grimmia unicolor* Hook

Distribution: Grimmia unicolor is found in Great Britain and Northern Ireland. It is found at low and high altitudes of 200-2000 m. Greater Caucasus: Oguz region (*Lyubarskaya*, 1986: 59).

Genus: *Grimmia* Hedw.
Species: *Grimmia pulvinata* (Hedw.) Sm.

Botanical description: The species *Grimmia pulvinata*, also known as gray cushion *Grimmia* or dry rock moss, is a moss found throughout the world in temperate climates. This species has a small cushion-shaped form, 1-2 centimeters high. Its color varies from gray-green to orange-yellow. The leaves are lanceolate, broad and oval on the underside and very narrow towards the tip. In some examples, the tip is silvery. The capsule is oval in shape and curls up when the plant dries [9].

Ecology: Spreads on a variety of surfaces including rocks, concrete and tree trunks. They are tolerant of a wide range of pH levels and can live on a variety of rocky reefs. However, they also prefer to live on old tree trunks.

Fig. 2.*Grimmia pulvinata* (Hedw.) Sm.

Distribution: This species is found throughout most of the world. This species is particularly common in the United Kingdom and the west coast of North America. It is found primarily in temperate regions up to 2,900 m above sea level. Its resistance to pollution allows this species to spread into urban areas such as houses, walls and asphalt [2, 10]. Greater Caucasus: (in Zagatala, Sheki, Ismayilly, Shamakhi, Guba, Absheron (*Lyubarskaya,* 1986: 62), Guba, Khachmaz (Baryakina, 2002), Gobustan regions (*Gasimov,* 2015); Kura Depression (Garayazinsky Nature Reserve (*Novruzov,* 1999); (Fig. 2.)
Central Araz region (in the Ordubad, Shahbuz regions of the Nakhchivan Autonomous Republic (*Alakbarov*, 2008); Lesser Caucasus (in the Shamkir (Gasimov, 2014), Tovuz, Ganja, Goygol, Gubadli regions (*Lyubarskaya,* 1986: 62); Lankaran region (in the *Masalli, Lerik , Yardimli* districts (*Lyubarskaya,* 1986: 62).

Genus: *Grimmia* Hedw.
Species: *Grimmia reflexidens* Müll.
Botanical characteristics: Grimmia with folded teeth is small, up to 1.0 cm in height, the color varies from dark green to blackish-green. Rarely branched, well developed, the lower part is covered with dense rhizoids. Leaves are twisted when dry, spreading when wet, 1.8-2.0 mm long, from ovate to broadly lanceolate, covered with twisted, smooth, transparent hairs on top. In the lower part of the stem, the edges of the leaves are narrow and bent to one side from the middle to the basal part [12]. The edges are 15–23 × 9-13 µm, 15–23 × 9-13 µm, with 2-4 rows of flat basal cells, with transverse walls, noticeably thicker than the longitudinal ones. Perichetial leaves are considerably larger, longer and smoother than vegetative ones. Capsule is elongated, erect, oval to oblong-ovate, yellowish-brown, about 1 mm. Leaves are ovate to oblong-lanceolate, 0.1-1.15 x 0.3-0.5 mm, with flat edges, very long, slightly serrated (Fig. 3.)

Fig. 3. *Grimmia reflexidens* Müll.

Ecology: Dry rock moss [6].
Distribution: Distributed in South America (Argentina, Chile), on the islands of the Atlantic Ocean (Iceland), on the islands of the Pacific Ocean (New Zealand) and Australia.
Greater Caucasus: Ismailly (*Lyubarskaya,* 1986: 61), Lesser Caucasus: Zangilan (*Mamedova,* 1984), Goygol, environs of Maralgol *(Mamedova,* 1992*).*

Genus: *Grimmia* Hedw.
Species: *Grimmia muehlenbeckii* Schimp.
Botanical characteristics: Found on blackish-green lawns. Stem 1-2.5 cm, leaves slightly compressed, twisted when dry, erect when moist, ovate-lanceolate, tapering to acute twisted tips, shortly twisted, serrated, pericecial leaves hairy. Basal lamellar cells protruding outward, open-winged, short rectangular, yellowish, nodular, thick-walled, and medial lamellar cells square-shaped, short rectangular and thick-walled (Fiq. 4). Calyx curved, spherical, shiny, brown, smooth or slightly striated, thin-walled, peristome teeth purple, fully developed or slightly dehiscent [7].

Fig. 4. *Grimmia muehlenbeckii* Schimp.

Ecology: Commonly found in damp crevices of siliceous rocks, especially along lake shores and in damp areas.
Distribution: Distributed in Great Britain and Ireland. As a species, it is new to the bryoflora of Azerbaijan.

Genus: *Grimmia* Hedw.
Species: *Grimmia trichophylla* Grev.
Botanical characteristics: Plants vary in color from yellowish-green to dark green, are located in dense or loose lawns. Stem 2-4 cm, leaves slightly curl when drying, changing to oblong-lanceolate, narrowed towards the top (Fig. 5.)

Fig. 5. *Grimmia trichophylla* Grev.

Size 2-3.5 × 0.3-0.4 mm, usually sharply curved, edges are bent on one or both sides, the shape can vary from flat to erect [11]. Capsule oblong-ovate, yellowish-green when dry, striped, exothecial cells thin-walled, peristome teeth yellowish, deeply fissured and (ragged) perforated. Grimmia trichophylla is common in the north and west, from light to yellow-green in color, can reach 1 cm and longer in the form of round cushions or loose spots. Leaves are 2-3 mm long. Young leaves are light green. The edges of the leaves are narrow, curved and tapering. When wet, the leaves straighten out, giving a pointed appearance. Dry leaves are twisted, spirally arranged [5, 13].
Ecology: In mountainous areas, it forms a large number of small neat cushions. In most cases, it lives on open stones, boulders, roofs and walls. It grows better mainly in open places in poorly shaded conditions. Distribution: Distributed in Great Britain and Ireland. Shamkir district (*Gasymov*, 2012)

Genus: *Grimmia* Hedw.
Species: *Grimmia anomala* Hampe.
Botanical characteristics: On lawns yellowish-green, sometimes blackish. Stem 1.5-3.5 cm. Leaves dry unevenly when dry, erect when wet, edges oblong-lanceolate, gradually narrowing to obtuse, 1.5-2.5 × 0.4-0.8 mm long and wide, edges curved on one or both sides, short, without a rib. Lamellar cells are square to short rectangular, flat, thin-walled, transversely thickened, short rectangular, medial lamellar cells are rounded-square, slightly thin-walled or thick-walled. Plants from flat to slightly curved when wet, 3-5 mm. The capsule is brown, oblong-ovoid, smooth, thick-walled, with long, straight beaks and peristome teeth that are orange, smooth, and perforated (Fig. 6).

Fig. 6. *Grimmia anomala* Hampe.

Ecology: Inhabits boreal and alpine meadows, slopes, damp acidic rocks.
Distribution: Distributed in Great Britain and Ireland. Distributed at low, medium and high altitudes (200-3000 m).
Lesser Caucasus (Goygol Reserve around Zaligel (*Mamedova*, 2004)

Family: *Orthotrichaceae* Arnotta
Genus: *Orthotrichum* Hedw.
Species: *Orthotrichum spesiosum* Nees in Sturum
Botanical characteristics: This is a single-leaf moss taken from a rock. Its grass is dark green. Mesoxerophyte, stem up to 5 cm high. Leaves are oblong-lanceolate. Sometimes the edges are gradually sharpened and bent. The capsule has 8 lines and long grooves. The cap is hairy, has a long beak. When the peristome dries, the teeth on it bend outward (Fig. 7). The capsule is 1.5-2.5 mm long, smooth or longitudinally grooved and unevenly folded. The cap is double-pinnate, narrow and pubescent [3].

Fig. 7. *Orthotrichum spesiosum* Nees in Sturum

Ecology: Distributed in forests on stumps, on rocks without limestone.
Distribution: Distributed in most areas of the Caucasus. Distributed on branches and trunks of deciduous trees in the boreal zone of the northern hemisphere. Sometimes it can be found on concrete structures.
Greater Caucasus: (in Zagatala, Sheki, Oguz, Ismayilli, Shamakhi, Guba (Lyubarskaya, 1986: 97, Guba, Khachmaz *Baryakina*, 2002, Shabran *Mamedova*, 2019 districts);
Lesser Caucasus: (in Zangilan, Goygol districts, around Maralgel *Mamedova*, 1991); Kura Depression (Garayazinsky Reserve (*Novruzov*, 2003); Srednearaza Region (Nakhchivan AR, *Alakbarov*, 2008).

Genus: *Orthotrichum* Hedw.
Species: *Orthotrichum strangulatum* P. Beauv
Botanical characteristics: Photographed on a rock. It is a mesoxerophyte, together with other mosses it forms synusia. Spores are 16-23 mm. Stem is 0.4-1.0 cm high. Leaves are hard, curl when dry, from ovate to oblong-lanceolate, 2-2.7 mm, edges are entire, at the apex they are sharp, narrow and obtuse, basal lamellar cells are quadrangular, thin-walled, distal cells are 7-12 µm in size. Specialized asexual reproduction does not exist. The calyx is elongated-ovate to oblong, 1.1-1.8 mm, distinctly 8-ribbed, narrowing downwards when dry (Fig. 8).

Ecology: Inhabits dry, calcareous or dolomite rocks, mainly at low and medium altitudes (from 150 to 700 m).

Fig. 8. *Orthotrichum strangulatum* P. Beauv

Distribution: Widely distributed in North America and the Mississippi River basin.
East of the village of Nurgut (2200 m), Ordubad district (04.VII.2003), western side of Duzdag (900 m), territory of Babek district (25.X.2003), north of Bagirsagdari(1200 m), Sharur district (13.IV.2006), discovered by researcher R.A.Alakbarov in the eastern (08.VI.2006) village of Khoshkeshin (1250 m), Julfa district.

Family: *Fontinalaceae* Schimp.
Genus: *Fontinalis* Hedw.
Species: *Fontinalis antipyritica* Hedw.
Botanical characteristics: Fontinalis antipyritica is branched, triangular in cross-section, 60 cm long. The leaves are quite hard and are arranged in three overlapping rows. Each leaf is lanceolate or ovate, 4-9 mm long, acute. Its small spores are formed in smooth sporangia 2-2,6 mm long. Reproduction is carried out mainly by stolons or rooting of individual parts. Reproduction also occurs in the spring in North America [14].
Ecology: This species grows attached to underwater rocks in fast-flowing water. It also attaches to the substrate as floating masses in lakes and stagnant water and inhabits coastal lawns. It feels good in shaded places, preferring acidic or slightly alkaline water (pH 8.4). Fontinalis antipyretica grows in the form of large clumps and mats (Fig. 9).

Fig. 9. *Fontinalis antipyritica* Hedw.

The leaves of these plants provide shelter for a large number of invertebrates. Chironomid larvae hide on the underside of the leaves and attach themselves to the leaves. Diatoms and other microscopic algae grow epiphytically on the leaves.
Distribution: Found in both stagnant and flowing fresh waters of Asia, Greenland, and Africa. In North America, they live along the coast, in most provinces of Canada (except the southernmost provinces), and in most states of the USA.
Greater Caucasus: (in the Zagatala region, *Lyubarskaya,* 1986: 102)
Lesser Caucasus: (in the Kelbajar region, in Karabakh, *Lyubarskaya,* 1986: 102), around Maralgel (*Mamedova*, 1992); Middle Araz region (Nakhchivan AR, *Alakbarov,* 2008)
Result: The main objective of the research conducted in this area was to study spore plants (bryoflora) common in this territory. As a result of scientific research, 9 species of mosses were discovered. Of these: *Grimmia muehlenbeckii* Schimp. as a species is new to the bryoflora of Azerbaijan.

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